CLAIMS:

What is claimed is:

1. An ion implantation system, comprising:

an ion source adapted to produce an ion beam along a path;

a beamline assembly located downstream from the ion source along the path, the beamline assembly comprising:

a beamguide defining a passageway through which the ion beam is transported along the path;

a photoelectron source located along at least a portion of the passageway; and

a photon source providing photons to at least a portion of the photoelectron source to cause emission of photoelectrons from the photoelectron source; and

an end station located downstream from the beamline assembly along the path, the end station being adapted to support at least one wafer along the path for implantation using the ion beam.

2. The ion implantation system of claim 1, wherein the photoelectron source comprises an inner wall of the beamguide.

3. The ion implantation system of claim 2, wherein the photon source comprises at least one lamp providing light to the photoelectron source.

4. The ion implantation system of claim 3, wherein the at least one lamp provides photons to the photoelectron source having an energy exceeding a work function of the photoelectron source.

5. The ion implantation system of claim 3, wherein the at least one lamp provides ultraviolet or visible light to the photoelectron source.

6. The ion implantation system of claim 3, wherein the inner wall of the beamguide comprises aluminum.

7. The ion implantation system of claim 6, wherein the inner wall of the beamguide comprises lanthanum hexaboride.

8. The ion implantation system of claim 3, wherein the inner wall of the beamguide comprises lanthanum hexaboride.

9. The ion implantation system of claim 2, wherein the inner wall of the beamguide comprises aluminum.

10. The ion implantation system of claim 2, wherein the inner wall of the beamguide comprises lanthanum hexaboride.

11. The ion implantation system of claim 2, wherein the beamline assembly further comprises a magnetic device adapted to provide multi-cusped magnetic fields in at least a portion of the passageway.

12. The ion implantation system of claim 11, wherein the magnetic device comprises a plurality of permanent magnets located along at least a portion of the passageway.

13. The ion implantation system of claim 12, wherein the plurality of magnets are mounted along an outer surface of at least one beamguide wall.

14. The ion implantation system of claim 2, wherein the beamline assembly further comprises a mass analyzer through which a portion of the beamguide passes, the mass analyzer being adapted to receive the ion beam from the ion source and to direct ions of a desired charge-to-mass ratio along the path toward the end station.

15. The ion implantation system of claim 14, wherein the photoelectron source and the photon source cooperatively provide photoelectrons in the portion of the beamguide which passes through the mass analyzer.

16. The ion implantation system of claim 1, wherein the photon source comprises at least one lamp providing light to the photoelectron source.

17. The ion implantation system of claim 16, wherein the at least one lamp provides photons having an energy exceeding a work function of the photoelectron source.

18. The ion implantation system of claim 16, wherein the at least one lamp provides ultraviolet or visible light to the photoelectron source.

19. The ion implantation system of claim 1, wherein the photoelectron source comprises aluminum.

20. The ion implantation system of claim 19, wherein the photoelectron source comprises lanthanum hexaboride.

21. The ion implantation system of claim 1, wherein the beamline assembly further comprises a magnetic device adapted to provide multi-cusped magnetic fields in at least a portion of the passageway.

22. The ion implantation system of claim 21, wherein the magnetic device comprises a plurality of permanent magnets located along at least a portion of the passageway.

23. The ion implantation system of claim 1, wherein the beamline assembly further comprises a mass analyzer through which a portion of the beamguide passes, the mass analyzer being adapted to receive the ion beam from the ion source and to direct ions of a desired charge-to-mass ratio along the path toward the end station.

24. The ion implantation system of claim 23, wherein the photoelectron source and the photon source cooperatively provide photoelectrons in the portion of the beamguide which passes through the mass analyzer.

25. The ion implantation system of claim 1, wherein the photoelectron source is spaced from a wall of the beamguide.

26. The ion implantation system of claim 25, wherein the beamline assembly further comprises a conductive sheath spaced from the photoelectron source and wherein the photoelectron source is biased with respect to the conductive sheath.

27. The ion implantation system of claim 26, wherein the conductive sheath comprises at least one opening.

28. The ion implantation system of claim 26, wherein the beamline assembly further comprises a magnetic device adapted to provide multi-cusped magnetic fields in at least a portion of the passageway.

29. The ion implantation system of claim 28, wherein the magnetic device comprises a plurality of permanent magnets located along at least a portion of the passageway.

30. The ion implantation system of claim 28, wherein the magnetic device provides multi-cusped magnetic fields at the photoelectron source to enhance emission of photoelectrons.

31. The ion implantation system of claim 1, wherein the photon source comprises at least one laser.

32. The ion implantation system of claim 1, wherein the beamguide comprises at least one window and wherein the photon source is located outside the beamguide to provide photons to at least a portion of the photoelectron source through the at least one window.

33. Beam confinement apparatus for inhibiting ion beam blowup in an ion beam transport passageway, the confinement apparatus comprising:

a photoelectron source located along at least a portion of the passageway; and

a photon source providing photons to at least a portion of the photoelectron source to cause emission of photoelectrons from the photoelectron source.

34. The apparatus of claim 33, wherein the photoelectron source comprises an inner wall of a beamguide defining the passageway.

35. The apparatus of claim 33, wherein the photon source comprises at least one lamp providing light to the photoelectron source.

36. The apparatus of claim 33, further comprising a magnetic device adapted to provide multi-cusped magnetic fields in at least a portion of the passageway.

37. The apparatus of claim 33, wherein the photoelectron source and the photon source cooperatively provide photoelectrons in a portion of the passageway passing through a mass analyzer.

38. The apparatus of claim 33, further comprising a conductive sheath spaced from the photoelectron source, wherein the photoelectron source is biased with respect to the conductive sheath.

39. The apparatus of claim 38, further comprising a magnetic device adapted to provide multi-cusped magnetic fields in at least a portion of the passageway.

40. The apparatus of claim 39, wherein the magnetic device provides multi-cusped magnetic fields at the photoelectron source to enhance emission of photoelectrons.

41. The apparatus of claim 33, wherein the photon source comprises at least one laser.

42. The apparatus of claim 33, wherein the passageway comprises at least one window and wherein the photon source is located outside the passageway to provide photons to at least a portion of the photoelectron source through the at least one window.

43. A method of providing ion beam containment in an ion implantation system, the method comprising:

providing a photoelectron source along an ion beam path; and

providing photons to at least a portion of the photoelectron source to cause emission of photoelectrons from the photoelectron source.

44. The method of claim 43, wherein providing the photoelectron source comprises providing a beamguide downstream from an ion source, the beamguide defining a passageway through which the ion beam is transported along the path, and wherein providing photons comprising providing photons to at least a portion of the beamguide to cause emission of photoelectrons from the beamguide.

45. The method of claim 43, wherein providing the photons comprises providing at least one lamp or laser along the path to provide light to the photoelectron source.

46. The method of claim 43, wherein providing the photons comprises providing photons to the photoelectron source having an energy exceeding a work function of the photoelectron source.

47. The method of claim 43, further comprising providing multi-cusped magnetic fields at the photoelectron source to enhance emission of photoelectrons.

48. The method of claim 43, further comprising:

providing a conductive sheath spaced from the photoelectron source; and

biasing the photoelectron source negatively with respect to the conductive sheath to enhance emission of photoelectrons.

49. The method of claim 48, further comprising providing multi-cusped magnetic fields at the photoelectron source to enhance emission of photoelectrons.